

WHAT IS CLAIMED IS:

- 1 1. A method for packaging and singulating a micro device wafer having a
2 plurality of micro devices, the method comprising:
3 providing a multi-lid substrate with a trench pattern on a first side of
4 the multi-lid substrate, the trench pattern having intersection portions and non-
5 intersection portions;
6 coupling the multi-lid substrate to the micro device wafer such that the
7 intersection portions of the trench pattern extend adjacent to at least two micro
8 devices; and
9 removing portions of the multi-lid substrate between a second side of
10 the multi-lid substrate and the trench pattern while the multi-lid substrate is coupled to
11 the micro device wafer.
- 1 2. The method of Claim 1, wherein the trench pattern is configured such
2 that only a single non-intersection portion extends between consecutive micro devices
3 of the micro device wafer when the multi-lid substrate is coupled to the micro device
4 wafer.
- 1 3. The method of Claim 1, wherein each micro device includes a main
2 portion and a contact point projecting from the main portion, wherein the non-
3 intersection portion of the trench pattern has a width forming an opening adjacent to
4 at least one contact point of at least one device when the multi-lid substrate is coupled
5 to the micro device wafer.
- 1 4. The device of Claim 3, wherein the opening is adjacent a first contact
2 point of a first micro device and a second contact point of a consecutive second micro
3 device.
- 1 5. The method of Claim 3, wherein each micro device has a plurality of
2 contact points projecting from the main portion and wherein the opening is adjacent
3 the plurality of contact points.

1 6. The method of Claim 1, wherein each micro device has a main portion,
2 a first contact point on a first side of the main portion and a second contact point on a
3 second side of the main portion and wherein the trench pattern is configured to form
4 openings adjacent the first contact point and the second contact point when the multi-
5 lid substrate is coupled to the micro device wafer.

1 7. The method of Claim 1, wherein the trench pattern extends opposite a
2 passageway portion of the micro device wafer when the multi-lid substrate is coupled
3 to the micro device wafer and wherein the micro device wafer is separated into dies
4 along separation lines within the passageway portion.

1 8. The method of Claim 1, wherein the multi-lid substrate includes a glass
2 material.

1 9. The method of Claim 1, wherein the trench pattern is formed by
2 cutting into the first side of the multi-lid substrate.

1 10. The method of Claim 9, wherein the trench pattern is formed by a
2 process selected from a group including:
3 photolithography, sand drilling, laser cutting, use of a water jet,
4 molding and material deposition.

1 11. The method of Claim 9, wherein the portions are removed by cutting
2 into the second side of the multi-lid substrate.

1 12. The method of Claim 11, wherein the portions are removed by sawing
2 into the second side of the multi-lid substrate.

1 13. The method of Claim 1, wherein the portions are removed by cutting
2 into the second side of the multi-lid substrate.

1 14. The method of Claim 1, wherein each micro device includes a main
2 portion and a contact point projecting from the main portion and wherein the step of
3 coupling the multi-lid substrate to the micro device wafer includes forming a seal

4 between the multi-lid substrate and the micro device wafer and about each main
5 portion between each main portion and each contact point.

1 15. The method of Claim 14, wherein the step of forming a seal includes
2 locating a bond ring about each main portion between each main portion and each
3 contact point.

1 16. The method of Claim 15, wherein the step of locating the bond ring
2 includes coupling the bond ring to the multi-lid substrate prior to coupling the multi-
3 lid substrate to the micro device wafer.

1 17. The method of Claim 15, wherein the step of locating the bond ring
2 includes coupling the bond ring to the micro device wafer prior to coupling the multi-
3 lid substrate to the micro device wafer.

1 18. The method of Claim 1, wherein at least one of the micro devices
2 includes a micro machine.

1 19. The method of Claim 18, wherein the plurality of micro devices
2 includes at least one display micro machine.

1 20. The method of Claim 1, wherein the multi-lid substrate is at least semi-
2 transparent.

1 21. The method of Claim 1, wherein the non-intersection portions of the
2 trench pattern have a width of between about 50 and 2000 micrometers and a depth of
3 between about 50 and 1000 micrometers.

1 22. The method of Claim 1, wherein the multi-lid substrate is spaced from
2 the micro device.

1 23. The method of Claim 1, wherein the multi-lid substrate is formed from
2 a non-silicon material.

1 24. The method of Claim 1 including separating the micro device wafer
2 into dies.

1 25. The method of Claim 1 including providing a protective material
2 between a floor of the trench pattern and an opposite portion of the micro device
3 wafer.

1 26. The method of Claim 25 including coating the floor portion of the
2 trench pattern with the protective material.

1 27. The method of Claim 25 including applying the protective material to
2 the opposite portion of the micro device wafer.

1 28. The method of Claim 27 including removing the protective material
2 from the opposite portion of the micro device wafer.

1 29. A method for packaging and singulating a first micro device having a
2 first main portion and a first contact point and a second micro device having a second
3 main portion and a second contact point, wherein the first micro device and the
4 second micro device are supported by a common device substrate, the method
5 comprising:
6 providing a multi-lid substrate having a trench on a first side of the
7 multi-lid substrate, the trench having a width;
8 coupling the multi-lid substrate to the device substrate such that the
9 first side faces the device substrate and such that the trench extends between the first
10 main portion and the second main portion adjacent to both the first contact point and
11 the second contact point; and
12 removing portions of the multi-lid substrate between a second side of
13 the multi-lid substrate and the trench so as to expose the first contact point and the
14 second contact point.

1 30. The method of Claim 29 including forming a seal between the multi-
2 lid substrate and the device substrate about the first micro device between the first
3 main portion and the first contact point.

1 31. The method of Claim 29 including spacing the multi-lid substrate from
2 the first micro device.

1 32. The method of Claim 29, wherein the trench is formed by cutting into
2 the first side of the multi-lid substrate.

1 33. The method of Claim 32, wherein the portion of the multi-lid substrate
2 is removed by cutting into the second side of the multi-lid substrate opposite the
3 trench.

1 34. The method of Claim 23, wherein the multi-lid substrate is formed
2 from one or more non-silicon materials.

1 35. The method of Claim 29 including separating the device substrate into
2 a first die including the first micro device and a second die including the second micro
3 device.

1 36. The method of Claim 29 including providing a protective material
2 between a floor of the trench and the first contact point prior to removing portions of
3 the multi-lid substrate between the second side and the trench.

1 37. The method of Claim 36 including depositing the protective material
2 upon the floor portion of the trench.

1 38. The method of Claim 36 including depositing the protective material
2 upon the first contact point.

1 39. The method of Claim 38 including removing the protective material
2 from the first contact point.

1 40. A method for packaging and singulating a micro device wafer having a
2 plurality of micro devices, the method comprising:

3 providing a multi-lid substrate having a trench pattern on a first side of
4 the multi-lid substrate, the trench pattern having intersection portions and non-
5 intersection portions;

6 coupling the multi-lid substrate to the micro device wafer, wherein the
7 trench pattern is configured such that only a single non-intersection portion of the
8 trench pattern extends between consecutive micro devices of the micro device wafer
9 when the multi-lid substrate is coupled to the micro device wafer; and

10 removing portions of the multi-lid substrate between a second side of
11 the multi-lid substrate and the trench pattern while the multi-lid substrate is coupled to
12 the micro device wafer.

1 41. A method for packaging and singulating a micro device wafer having a
2 plurality of micro devices, the method comprising:

3 providing a multi-lid substrate having a trench pattern on a first side of
4 the multi-lid substrate;

5 bonding the multi-lid substrate to the micro device wafer with a bond
6 ring between the multi-lid substrate and the micro device wafer such that individual
7 micro devices are hermetically sealed with contact pads of each micro device being
8 located beyond each bond ring opposite the trench pattern; and

9 sawing a second side of the multi-lid substrate to a depth until the
10 trench is reached to expose the contact pads.

1 42. The method of Claim 41, wherein the multi-lid substrate is formed
2 from a non-silicon material.

1 43. The method of Claim 41, wherein the multi-lid substrate is formed
2 from glass.

1 44. The method of Claim 41, wherein the bond ring spaces the multi-lid
2 substrate from the micro devices.

1 45. The method of Claim 41, wherein the bond ring is formed on the first
2 side of the multi-lid substrate along the trench pattern prior to the multi-lid substrate
3 being bonded to the micro device wafer.

1 46. The method for packaging and singulating a micro device wafer having
2 a micro device with a contact point, the method comprising:
3 providing a multi-lid substrate having a trench on a first side of the
4 multi-lid substrate, the trench having a floor;
5 coupling the multi-lid substrate to the micro device wafer such that the
6 floor extends opposite the contact point;
7 providing a protective material between the floor and the first contact
8 point; and
9 removing portions of the multi-lid substrate between a second side of
10 the multi-lid substrate and the trench while the multi-lid substrate is coupled to the
11 micro device wafer.

1 47. The method of Claim 46 including removing the protective material.

1 48. The method of Claim 46 wherein the protective material is provided by
2 depositing the protective material upon the floor.

1 49. The method of Claim 46, wherein the protective material is provided
2 by depositing the protective material upon the contact point.

1 50. A multi-device lid for a micro device wafer having a plurality of micro
2 devices, the multi-device lid comprising:
3 a multi-lid substrate configured to cover the plurality of micro devices
4 of the micro device wafer, the multi-lid substrate having a trench pattern with
5 intersection portions and non-intersection portions on a first side of the multi-lid
6 substrate, wherein the trench pattern is configured such that the intersection portions
7 of the trench pattern extend adjacent to at least two of the plurality of micro devices
8 when the multi-lid substrate is coupled to the micro device wafer.

1 51. The multi-device lid of Claim 50, wherein the trench pattern is
2 configured such that only a single non-intersection trench portion extends between
3 consecutive micro devices of the micro device wafer when the multi-lid substrate is
4 coupled to the micro device wafer.

1 52. The multi-device lid of Claim 50, wherein each micro device includes
2 a main portion and a contact point projecting from the main portion, wherein the non-
3 intersection portions of the trench pattern have a width forming an opening such that
4 the opening extends adjacent to at least one contact point of at least one device when
5 the multi-device lid is coupled to the micro device wafer.

1 53. The lid of Claim 52, wherein the opening is configured to extend
2 adjacent a first contact point of a first micro device and a second contact point of a
3 consecutive second micro device of the micro device wafer when the multi-device lid
4 is coupled to the micro device wafer.

1 54. The lid of Claim 52, wherein each micro device has a plurality of
2 contact points projecting from the main portion and wherein the opening is configured
3 so as to extend adjacent the plurality of contact points when the multi-device lid is
4 coupled to the micro device wafer.

1 55. The lid of Claim 50, wherein each micro device has a main portion, a
2 first contact point on a first side with the main portion and a second contact point on a
3 second side of the main portion and wherein the trench pattern is configured to form
4 openings adjacent the first contact point and the second contact point when the multi-
5 device lid is coupled to the micro device wafer.

1 56. The lid of Claim 50, wherein the multi-lid substrate is at least semi-
2 transparent.

1 57. The lid of Claim 50, wherein the multi-lid substrate is formed from
2 glass.

1 58. The lid of Claim 50, wherein the multi-lid substrate is formed from at
2 least one non-silicon material.

1 59. The lid of Claim 50 including a bond ring coupled to the multi-lid
2 substrate and configured to form a seal between the multi-lid substrate and the micro
3 device wafer when the multi-device lid is coupled to the micro device wafer.

1 60. The lid of Claim 50, wherein the trench pattern includes a plurality of
2 intersecting linear trenches.

1 61. The lid of Claim 50, wherein the trench pattern includes a plurality of
2 intersecting non-linear trenches.

1 62. The lid of Claim 50, wherein the trench pattern includes trenches
2 having a depth of at least 50 micrometers.

1 63. The lid of Claim 50, wherein the trench pattern includes trenches
2 having a width of at least about 50 micrometers.

1 64. The lid of Claim 50 including a seal coupled to the multi-lid substrate
2 along the trench pattern.

1 65. A multi-device lid for a micro device wafer having a micro device with
2 a contact point, the multi-device lid comprising:

3 a multi-lid substrate configured to cover a micro device of the micro
4 device wafer, the multi-lid substrate having a trench with a floor configured to extend
5 opposite the contact point when the multi-lid substrate is coupled to the micro device
6 wafer; and

7 a protective material coupled to the multi-lid substrate within the
8 trench and opposite the floor.